

WHAT IS CLAIMED IS:

1. A hydraulic brake apparatus for applying braking force to each wheel of a vehicle in response to depression of a manually operated braking member comprising:

a cylinder body mountable on said vehicle;

a reservoir for storing brake fluid;

a master cylinder having a master piston slidably received in said cylinder body to define a pressure chamber ahead of said master piston and a power chamber behind said master piston, the brake fluid in said reservoir being fed into said pressure chamber, and said master piston being moved in response to operation of said manually operated braking member to discharge hydraulic brake pressure from said pressure chamber;

an auxiliary pressure source for pressurizing the brake fluid in said reservoir to discharge power pressure of a predetermined value;

a control piston slidably disposed in said cylinder body ahead of said master piston to be movable in response to movement of said master piston, said control piston defining ahead thereof a regulator chamber, and exposing a rear end thereof to said pressure chamber, said power chamber being communicated with said regulator chamber to assist forward movement of said master piston;

pressure increase valve means for communicating said regulator chamber with said auxiliary pressure source or cutting off the communication therebetween in response to

movement of said control piston;

pressure decrease valve means for communicating said regulator chamber with said reservoir or cutting off the communication therebetween in response to movement of said control piston;

counter-force means for defining a counter-force pressure chamber communicating with said regulator chamber, with the pressure generated in said auxiliary pressure source being supplied to said counter-force pressure chamber through said pressure increase valve means to move said pressure increase valve means and said pressure decrease valve means in a direction opposite to a direction thereof moved by said control piston;

first valve means for normally preventing the flow of brake fluid from said counter-force pressure chamber to said regulator chamber, and allowing the flow of brake fluid from said regulator chamber to said counter-force pressure chamber when the pressure in said regulator chamber has become equal to or more than the pressure in said counter-force pressure chamber by a first predetermined pressure; and

second valve means for normally preventing the flow of brake fluid from said regulator chamber to said counter-force pressure chamber, and allowing the flow of brake fluid from said counter-force pressure chamber to said regulator chamber when the pressure in said counter-force pressure chamber has become equal to or more than the pressure in

said regulator chamber by a second predetermined pressure, which is set to be greater than the first predetermined pressure.

2. A hydraulic brake apparatus as set forth in claim 1, wherein the first predetermined pressure is set to be approximately zero.

3. A hydraulic brake apparatus as set forth in claim 1, wherein said first valve means includes a first check valve disposed between said counter-force pressure chamber and said regulator chamber for normally preventing the flow of brake fluid from said counter-force pressure chamber to said regulator chamber, and allowing the flow of brake fluid from said regulator chamber to said counter-force pressure chamber when the pressure in said regulator chamber has become equal to or more than the pressure in said counter-force pressure chamber by the first predetermined pressure.

4. A hydraulic brake apparatus as set forth in claim 1, wherein said second valve means includes a second check valve disposed between said counter-force pressure chamber and said regulator chamber for normally preventing the flow of brake fluid from said regulator chamber to said counter-force pressure chamber, and allowing the flow of brake fluid from said counter-force pressure chamber to said regulator chamber when the pressure in said counter-force pressure chamber has become equal to or more than the pressure in said regulator chamber by the second predetermined pressure.

5. A hydraulic brake apparatus as set forth in claim 1,

wherein said cylinder body is formed with a recess opening to outside thereof and communicating with said regulator chamber and said counter-force pressure chamber, and wherein said first valve means and said second valve means are disposed in said recess.

6. A hydraulic brake apparatus as set forth in claim 1, wherein said counter-force means includes a resilient member disposed ahead of said pressure increase valve means and said pressure decrease valve means in said cylinder body for defining said counter-force pressure chamber ahead of said pressure increase valve means and said pressure decrease valve means, and wherein said resilient member is supported by said cylinder body to receive the pressure in said counter-force pressure chamber.

7. A hydraulic brake apparatus as set forth in claim 6, wherein said first valve means includes a first check valve disposed between said counter-force pressure chamber and said regulator chamber for normally preventing the flow of brake fluid from said counter-force pressure chamber to said regulator chamber, and allowing the flow of brake fluid from said regulator chamber to said counter-force pressure chamber when the pressure in said regulator chamber has become equal to or more than the pressure in said counter-force pressure chamber by the first predetermined pressure, and wherein said second valve means includes a second check valve disposed between said counter-force pressure chamber and said regulator chamber for normally preventing the flow

of brake fluid from said regulator chamber to said counter-force pressure chamber, and allowing the flow of brake fluid from said counter-force pressure chamber to said regulator chamber when the pressure in said counter-force pressure chamber has become equal to or more than the pressure in said regulator chamber by the second predetermined pressure.

8. A hydraulic brake apparatus as set forth in claim 7, wherein said cylinder body is formed with a recess opening to outside thereof and communicating with said regulator chamber and said counter-force pressure chamber, and wherein said first check valve and said second check valve are disposed in said recess.

9. A hydraulic brake apparatus as set forth in claim 7, wherein the first predetermined pressure is set to be approximately zero.